

## Self-Organizing Maps for Fast LES Combustion Modeling, Phase I

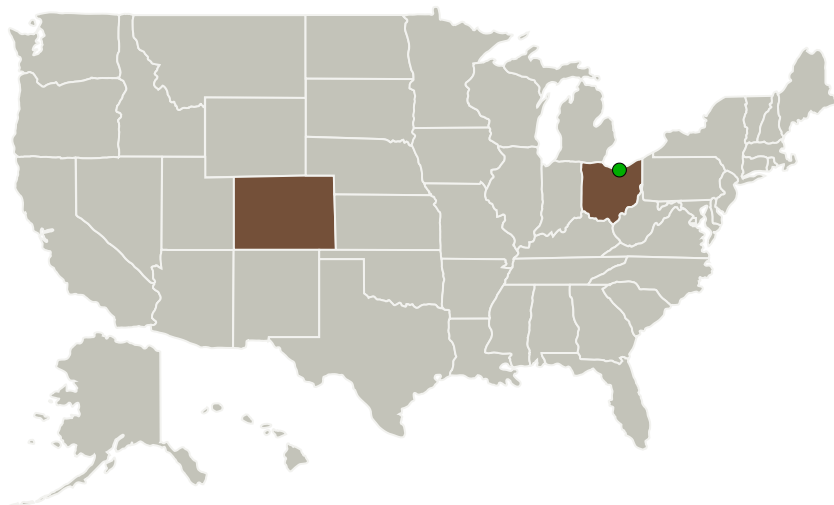
Completed Technology Project (2011 - 2011)



## Project Introduction

Tremendous advances have been made in the development of large and accurate detailed reaction chemistry models for hydrocarbon fuels. Comparable progress has also been achieved in CFD as an engineering design tool. Highly accurate hydrocarbon chemistry is now desired for simulating gas turbine combustors and automobile engines to better predict both performance and pollutant emissions. Newer and more accurate CFD techniques like Large Eddy Simulation (LES) are being used more as computational power increases along with the demand for better flow predictions. Unfortunately, using large, detailed chemical mechanisms to simulate real turbulent combustion devices is problematic due to the sheer computational burden of the added chemistry. As a result, chemistry mechanisms employing a large number of chemical species are currently only feasible to run in the simplest of flow geometries, and only the simplest and least accurate chemistry models are currently tractable to run in LES CFD codes. We propose using a unique neural network approach to create a fast and accurate species source term function that could alleviate both of these problems.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Reaction Systems, LLC	Lead Organization	Industry	Golden, Colorado
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Colorado	Ohio

## Project Transitions

▶ **February 2011:** Project Start

✓ **September 2011:** Closed out

## Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138493>)

## Organizational Responsibility

## Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

## Lead Organization:

Reaction Systems, LLC

## Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

## Program Director:

Jason L Kessler

## Program Manager:

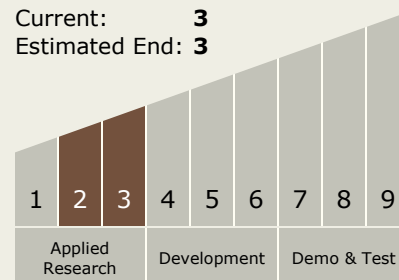
Carlos Torrez

## Principal Investigator:

Bradley Hitch

## Technology Maturity (TRL)

Start: 2  
Current: 3  
Estimated End: 3



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## Technology Areas

### Primary:

- TX15 Flight Vehicle Systems
  - └ TX15.1 Aerosciences
    - └ TX15.1.7 Computational Fluid Dynamics (CFD) Technologies

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System